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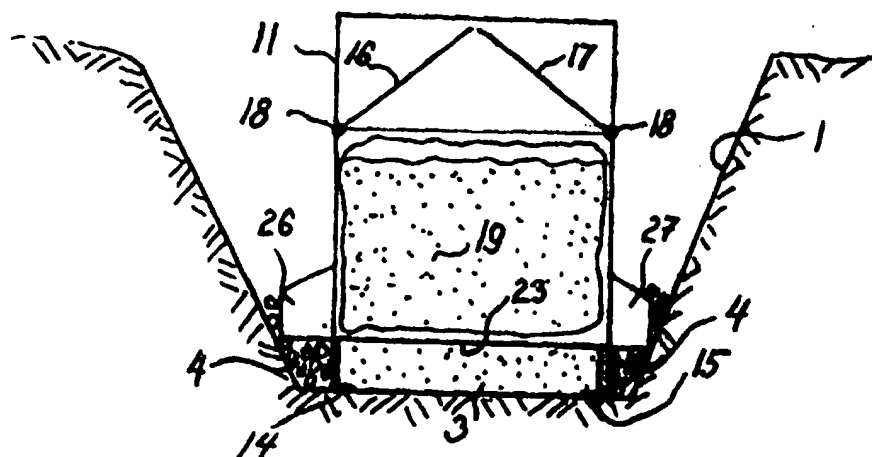
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<p>(21) International Application Number: PCT/NO96/00123 (22) International Filing Date: 21 May 1996 (21.05.96) (71)(72) Applicant and Inventor: WIKER, Omar [NO/NO]; Våler Gård, N-2080 Eidsvoll (NO). (74) Agent: LANGFELDT, Jens, F., C.; Bryns Patentkontor A/S, P.O. Box 765, Sentrum, N-0106 Oslo (NO).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report. In English translation (filed in Norwegian).</p>

(54) Title: A METHOD FOR LEVELLING AND FILLING OF DITCHES, AND A DEVICE FOR USE IN LEVELLING AND FILLING DITCHES



(57) Abstract

A method for levelling and filling a ditch is described, where a levelled layer of fine material is provided together with a contiguous layer of coarse material. A box-shaped device is described, having a height-adjustable rear end (11) which when raised and lowered will determine the levelling height of the fine material which is in the box-shaped frame and exits therefrom below the raiseable and lowerable end wall when the box-shaped frame is moved through a ditch. Lateral projections (26, 27) on the end wall (11) bring about a simultaneous dispensing/apportioning of coarse material along the side of the levelled layer of fine material (3). Whilst the box-shaped frame is moved forward and dispenses the layer of fine material, the side projections (26, 27) will deal with the dispensing/levelling of coarse material thrown thereon. The box-shaped frame has a roof (16, 17) having crossfall, which will guide the coarse material down to the side. The roof (16, 17) can be opened to allow the box-shaped frame to be filled with fine material.

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**A METHOD FOR LEVELLING AND FILLING OF DITCHES, AND A DEVICE FOR USE IN LEVELLING AND FILLING DITCHES**

- The invention relates to a method for levelling and filling ditches, in particular when
- 5 laying pipes, cables and similar, where there is established a levelled layer of fine material in the ditch, elements which require a levelled bed, such as pipes, cables and similar, are laid on the levelled layer and are covered with fine material, and the ditch is filled with coarse material.
- 10 The invention also relates to a device for use in levelling and filling ditches, uneven beds and similar, especially in connection with the laying of pipes, cables and similar.
- One specific objective of the invention is to be able to carry out the heavy work of levelling in an easier manner. In addition to allowing the work to be carried out in a
- 15 labour-saving fashion, it is also an objective of the invention to be able to make a considerable saving on the costly fine material or levelling material. The terms fine material and coarse material as used herein may relate directly to the structure of the material, i.e., that the materials concerned are fine and coarse, but for the sake of simplicity the terms are also used herein in a wider sense, where fine material or
- 20 levelling material is to comprise the costly materials, whereas coarse material is to comprise poorer quality or cheaper materials. In purely structural terms, coarse material in the sense of the invention might conceivably be more pulverised than fine material according to the invention.
- 25 With the above outlined method as a point of departure, it is proposed according to the invention that the levelled layer of fine material in the ditch be provided by apportioned arrangement whilst dispensed coarse material is laid simultaneously at the same level and approximately or substantially alongside the levelled layer of fine material.
- 30 If pipes, cables or similar are to be laid, these elements are laid on the established layer, whereupon the pipe, cable or similar is covered with a dispensed layer of fine material whilst dispensed coarse material is laid simultaneously at the same level and approximately or substantially alongside the dispensed layer of fine material, these operations optionally being repeated one or more times, after which the rest of the ditch
- 35 is filled in with suitable material.

The apportioned arrangement of the fine material and the simultaneous laying of dispensed coarse material at the same level alongside the layer of fine material allows the consumption of fine material to be restricted strictly to the area where levelling with fine material is necessary. The simultaneously laid coarse material helps to hold the levelled layer of fine material in place.

The method can be carried by using a device as mentioned above, which device is characterised in that it is constructed in the form of a box-shaped frame designed for movement over an underlying surface, having a front and a rear end and two opposing sides, where the rear end is designed to have a height-adjustable dispensing outlet for measured release of material with which the frame is filled when the frame moves forward on the underlying surface, said box-shaped frame having along its upper side wall edges surface units which can be assembled to form a roof having crossfall over the box-shaped frame. When using the device, it is placed on the underlying surface, for example in the bottom of the ditch. The height-adjustable dispensing outlet at the rear end is set in a start position and the box-shaped frame is filled with levelling material or fine material. The surface units are then put in place so that they form a roof having crossfall over the frame. When the box-shaped frame is moved forward it will spread an even layer of fine material, controlled by the height-adjustable dispensing outlet. At the same time, cheaper fill (coarse material) is emptied over the roof top so that this inferior material fills the bottom of the ditch on both sides of the box.

Coarse material spreading members may to advantage be located lateral to the dispensing outlet. These function in such a way that the coarse material, at least in the area alongside the fine material, is levelled at approximately the same height, thereby forming a base for re-positioning and movement of the box-shaped frame, when it is desirable or necessary to fill with more fine material, for example, after pipes, cables or similar have been laid on the previously laid fine material. When laying pipes, cables and so forth at several levels in the ditch, the box-shaped frame is moved through the ditch a corresponding number of times.

According to the invention, the said surface units can to advantage be hinged to the side walls of the box-shaped frame, so that they can easily be moved to and from the roof position.

It is of advantage for the rear end wall of the box-shaped frame to be capable of being raised and lowered relative to the box-shaped frame, for providing the said adjustable dispensing outlet.

- 5 The said spreading members can to advantage be designed as lateral projections on the rear raiseable/lowerable end wall.

- 10 Inside the box-shaped frame a dividing bottom can to advantage be provided parallel with the ground plane and provided with fixed or adjustable openings. This bottom is proportioned or adjusted such that no more fine material than necessary falls down for level spreading in the adjustable dispensing outlet.

- 15 The box-shaped frame may have suitable carrying members for supporting and facilitating/rendering possible movement of the box-shaped frame. These carrying members may, for example, be in the form of simple runners, but the use of wheels, crawler belts and similar is also conceivable.

- 20 In order to achieve exact levelling, the device during its movement, for example in a ditch, can to advantage have a device which operates the height-adjustable dispensing outlet, so that this is activated according to need in order to adjust the levelling height. Here, for example, known laser instruments could be used. On deviation from the desired levelling height/incline, the laser control can directly actuate an activation mechanism attached to the box-shaped frame. This may, for example, involve a hydraulic unit which can raise and lower the rear end wall, thereby actuating the  
25 dispensing outlet.

The invention will now be described in more detail with reference to the drawings, wherein:

- 30 Fig. 1 is a cross-section through a ditch with levelling layer laid by using the invention;  
Fig. 2 shows the same ditch, with a pipe laid in position on the established layer of fine material;  
Fig. 3 shows the pipe covered with a dispensed layer of fine material by using  
35 the invention;  
Fig. 4 shows the use of a device according to the invention for providing the levelled layer in Fig. 1;

- Fig. 5 shows the device in connection with the creation of the state illustrated in Fig. 3;
- Fig. 6 shows a ready filled ditch;
- Fig. 7 shows a perspective view of a device according to the invention;
- 5 Fig. 8 is a schematic section through the device in Fig. 7;
- Fig. 9 is a schematic section through a second embodiment of a device according to the invention;
- Fig. 10 is a schematic section through yet another possible embodiment of a device according to the invention;
- 10 Fig. 11 is a front view of the device;
- Fig. 12 is a perspective view of a device according to the invention;
- Fig. 13 is a schematic section through the device in Fig. 12; and
- Fig. 14 is a schematic horizontal projection of the device in Figs. 12 and 13.
- 15
- Fig. 1 shows a ditch 1 with a bottom 2. On the ditch bottom 2 a levelled layer 3 of fine material of desired/necessary width has been laid. Coarse material 4 has been laid along the edges of the layer of fine material. Both materials have been laid by being dispensed simultaneously in such a way that the coarse material will lie alongside the fine material and support this and prevent slip.
- 20
- Fig. 2 shows how a pipe is laid on the established or levelled fine material 3. The pipe is indicated by means of the reference numeral 5.
- 25
- Fig. 3 illustrates how by using the invention a top layer 6 of fine material has been laid around the pipe 5, with simultaneous build-up of restricting coarse material 4. This method can be repeated, possibly as shown in Fig. 6, where the ditch, moreover, is completely filled. In addition to the second layer of fine material 6, in Fig. 6 there is shown a further layer of fine material 7 laid thereon, around a pipe 8.
- 30
- The levelling/filling of the ditch shown in Figs. 1, 2, 3 and 6 can be carried out with a device as shown in use in Figs. 4 and 5, but before a more detailed explanation is given of the use of the device, the device itself will be described in more detail with reference to Figs. 7 and 8.
- 35
- The device illustrated in Figs. 7 and 8 is essentially constructed in the form of a box-shaped frame 9, having a front end wall 10, a rear end wall 11 and two opposing side

walls 12 and 13. The lower longitudinal edges of the side walls 12, 13 are designed to have longitudinal runners 14,15.

Two flaps 16,17 are hinged 18 to a respective longitudinal edge on the two longitudinal walls 12,13. These flaps form sheet members which can be assembled as shown in Fig. 7 to form a roof having crossfall, and can be swung to the side as indicated with the arrows, so that there is access to the box-shaped frame from above, for filling with fine material (19 in Fig 8).

As will be understood, the box-shaped frame has no bottom, but it does have an intermediate or dividing bottom 20, in Fig. 8 indicated as consisting of transverse ridges 21 with openings 22 in between. These openings may be fixed or adjustable. The openings may, for example, be adjusted in that the ridges 21 are capable of being set with a view to ridge angle. Here, a person versed in the art will see a number of possibilities that are known per se. The use of suitable vibrator means attached to the intermediate bottom to prevent blockages and/or to actuate dispensing through the openings is also conceivable.

The rear wall 11, in a manner not shown in more detail, is capable of being raised and lowered so that the lower edge 23 thereof forms a levelling working edge for the material 19.

In the front of the box-shaped frame there is a compartment 24 where, for example, a hydraulic unit can be located. A unit of this kind is used to manipulate the rear height-adjustable end wall 11, in a manner not illustrated in more detail. In this compartment 24, it is also possible to have propulsion equipment, for example, a small winch with which the box-shaped frame can be winched forward, if this is preferable to hauling or pulling the box forward with the line 25 as indicated in Fig. 8. The direction of movement of the box-shaped frame is indicated with the arrow in Fig. 8.

As shown in particular in Fig. 7, the rear end wall 11 has a respective lateral projection 26,27. These function as spreading members for the so-called coarse material, and this is shown in more detail in Figs. 4 and 5.

In Fig. 4 the box-shaped frame is shown positioned in the bottom of the ditch 1, resting on its runners 14, 15. Prior to the start of levelling, the roof flaps 16,17 are swung out to the side, so that the frame can be filled with material 19. The roof flaps 16,17 are

then swung back into roof position, as shown in Fig. 4. The box-shaped frame can now move forward in the ditch. Whilst the fine material 19 is dispensed using the edge or working edge 23 on the rear end wall 11, the side projections 26,27 will effect a spreading and dispensing of coarse material 4. This coarse material is supplied from  
5 above, it being dumped down onto the roof 16,17, manually or by using a suitable digger or loader (not shown).

As the box-shaped frame is moved forward in the ditch, a situation will arise as illustrated in Fig. 1. Once the pipe 5 has been laid, the box-shaped frame is run again as  
10 illustrated in Fig. 5. If more levels are desired/required, the box can be run yet again (Fig. 6) and so forth.

The working edge 23, which also extends along the projections 26,27, is decisive for the levelling height, i.e., that the levelling height can be adjusted by raising and lowering  
15 the rear end wall 11. As mentioned, this can take place with the aid of suitable means, controlled by means of a laser beam, so that exact levelling is obtained.

The said lateral projections 26,27 may be fixed or hinged and may optionally be arranged for individual height-adjustment.  
20

As shown, the invention allows the establishment of a central core of fine material in the ditch, surrounded by coarse material. This core of fine material (expensive material) is restricted to what is necessary.

25 The device can be modified in many ways. In Fig. 9 it is shown how the box-shaped frame can have an intermediate bottom 30, with an opening 31 towards the rear end wall 11. A piston plate 32 is attached to a telescopic cylinder 33 so that the piston plate can be pushed in the direction of the arrow, thereby causing a displacement of the fine material 19 towards the opening 31.

30

In Fig. 10, the device is provided with an intermediate bottom 34 having a incorporated, conveyor belt 35 which drives the material 19 backwards towards an opening 36. The conveyor belt can be driven at different, desired speeds by a non-illustrated drive means.

35 In Fig. 11 it is shown how an attachment lug 37 for the line 25 (Fig. 8) may be mounted on a rail (38) or similar, so that the straining point of the line can be displaced passively or actively (curve driving).



The box-shaped frame may be produced in large or small widths, depending upon the intended use.

- 5 In some cases the coarse material could have a tendency to spread out a little with accompanying gradual outward movement of the fine material, which will then form a heap or a ridge. This can to advantage be taken, i.e., levelled out, by a rear plough 40 as shown in Figs 12-14.
- 10 Similarly, it may be advantageous to have a front plough 41, which could plane out to the side and remove stones. A front plough of this kind is shown in Figs. 13 and 14.

Both the rear plough and the front plough are mounted using known means, such as attachment lugs and bars, well-known to a person versed in the art. Moreover, in Figs.

- 15 12 and 14 a hinged embodiment of the projections 26 and 27 is shown. The hinges are indicated at 42 and 43 in Figs. 12 and 14.

P a t e n t   c l a i m s

1.

A method for levelling and filling ditches, in particular when laying pipes, cables and  
5 similar, where there is established a levelled layer of dispensed fine material in the  
ditch, elements which require a levelled bed, such as pipes, cables or similar, are laid on  
the levelled layer and are optionally covered with fine material, and the ditch is filled  
with coarse material, characterised in that the levelled layer (13) of fine material in the  
10 ditch is provided whilst dispensed coarse material is laid simultaneously alongside the  
levelled layer of fine material at approximately the same level.

2.

A method according to Claim 1, comprising laying pipes, cables and similar,  
characterised in that the pipe (5), cable or similar is laid on the said levelled fine layer  
15 (13), after which the pipe, cable or similar is covered with a dispensed layer (6) of fine  
material whilst dispensed coarse material (4) is laid simultaneously alongside the  
dispensed layer of fine material at approximately the same level, with optional repetition  
of these operations, whereupon the rest of the ditch is filled with suitable material.

20 3.

A device for use in levelling and filling ditches, in connection with the laying of pipes,  
cables or similar, made in the form of a box-shaped frame designed for movement over  
an underlying surface, having a front (10) and a rear end (11) and two opposing sides  
(12,13), and designed to accommodate material, and where the rear end is designed to  
25 have a dispensing/spreading outlet, characterised in that the box-shaped frame along the  
upper side wall edges thereof has surface units (16,17) which can be assembled to form  
a roof having crossfall over the box-shaped frame, and in that lateral to the dispensing  
outlet (23) there project material spreading members (26,27).

30 4.

A device according to Claim 3, characterised in that the spreading members (26,27) are  
pivotally mounted on respective vertical hinges (43).

5.

35 A device according to Claim 3 or 4, characterised in that the rear end wall (11) is  
capable of being raised and lowered relative to the box-shaped frame to provide a

height-adjustable dispensing outlet (23), said spreading members (26,27) being constructed as lateral projections on this rear raiseable and lowerable end wall (11).

6.

- 5 A device according to Claims 3 to 5, where the box-shaped frame has a dividing bottom (20;30;34) preferably arranged parallel to the ground plane and provided with openings (22), characterised in that the dividing bottom (30;34) has an opening (31;36) towards the rear end wall and is attached to a material drive means (32,33;35) for driving the material in the direction of said opening (31;36), for example, in the form of a sliding  
10 piston (32) or a conveyor belt (35).

7.

- A device according to one of preceding Claims 3 to 6, characterised in that an attachment lug (37) or similar is mounted on a rail (38) or similar on the front end wall  
15 (10) so as to be transversely displaceable.

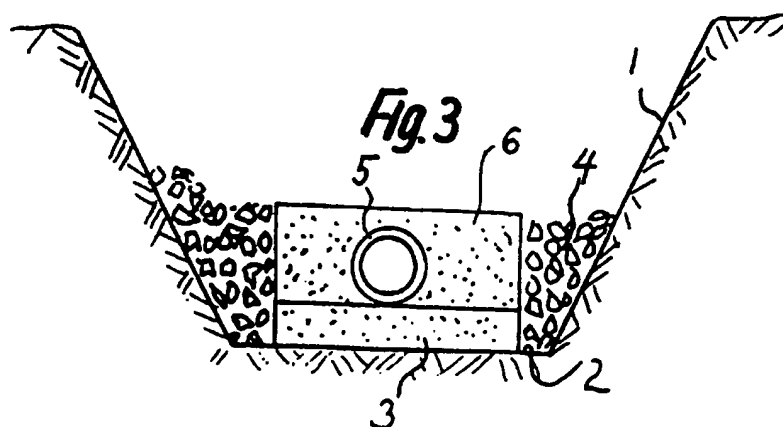
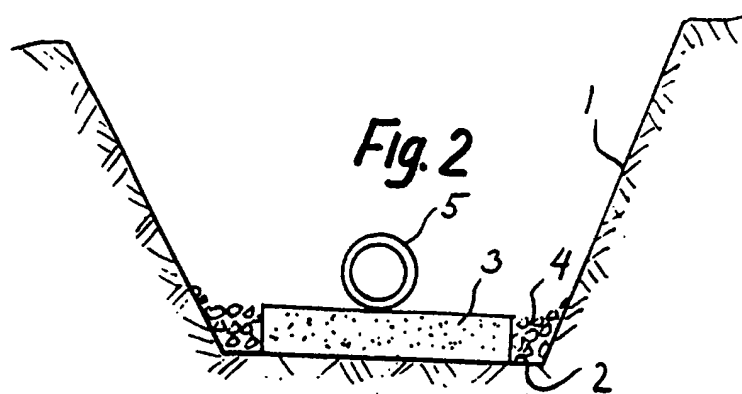
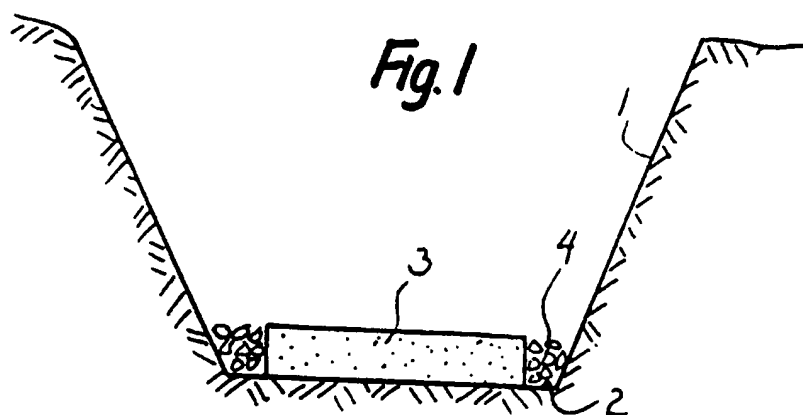
8.

- A device according to one of preceding Claims 3 to 7, characterised by a rear plough (40) (trailing plough) between the spreading members (26,27).  
20

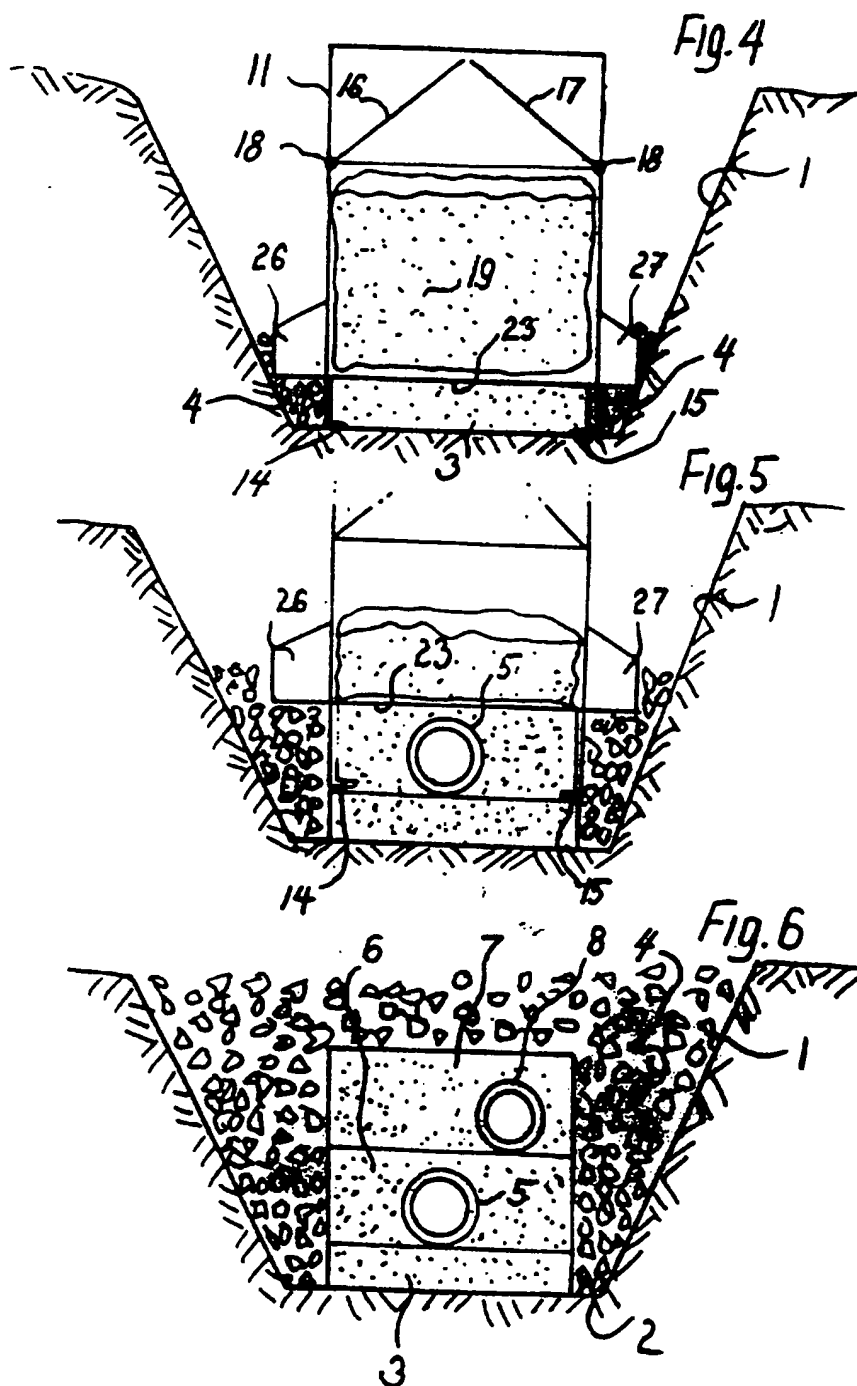
9.

- A device according to one of preceding Claims 3 to 8, characterised by a front plough (41).

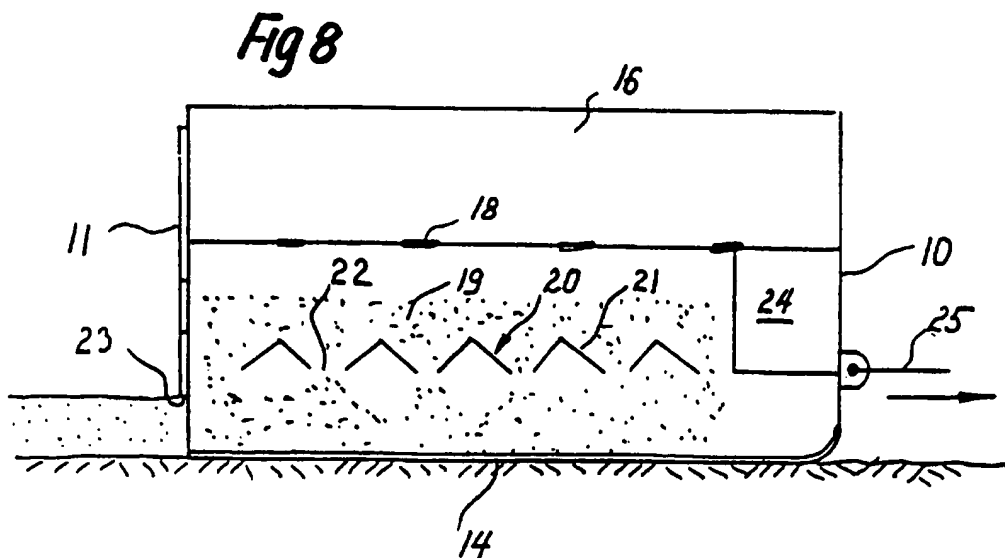
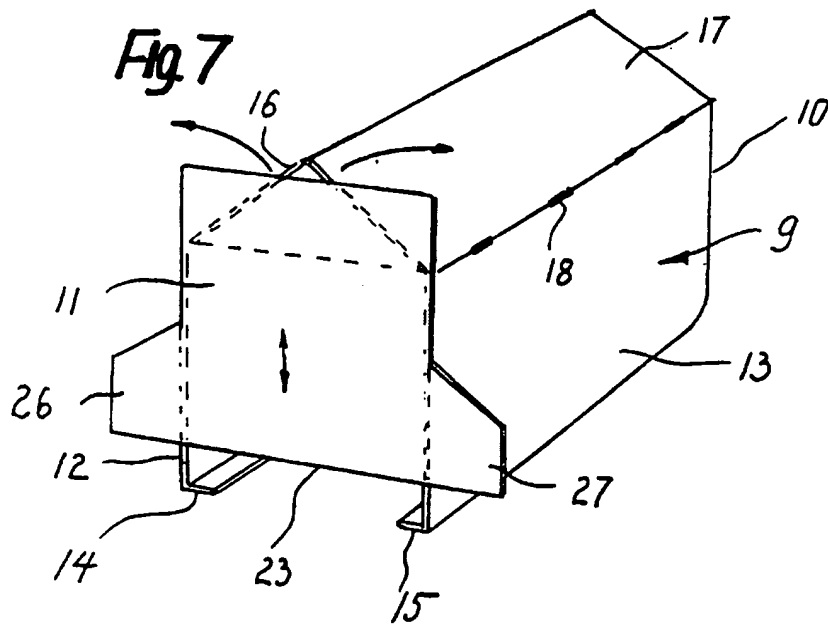
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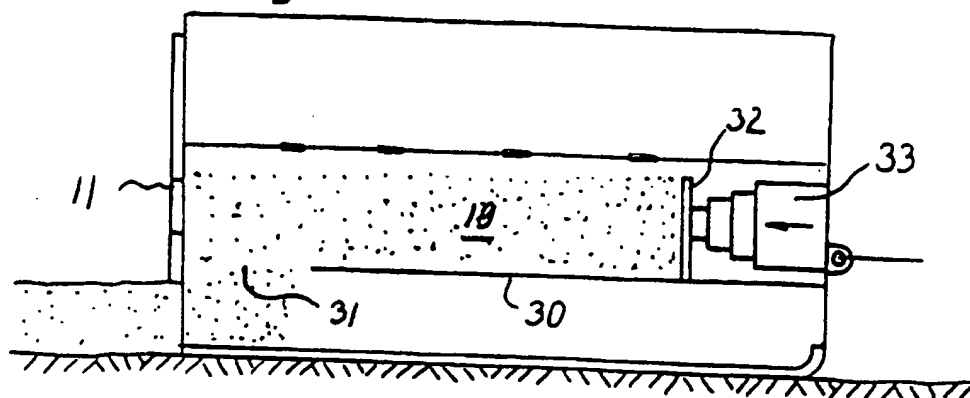
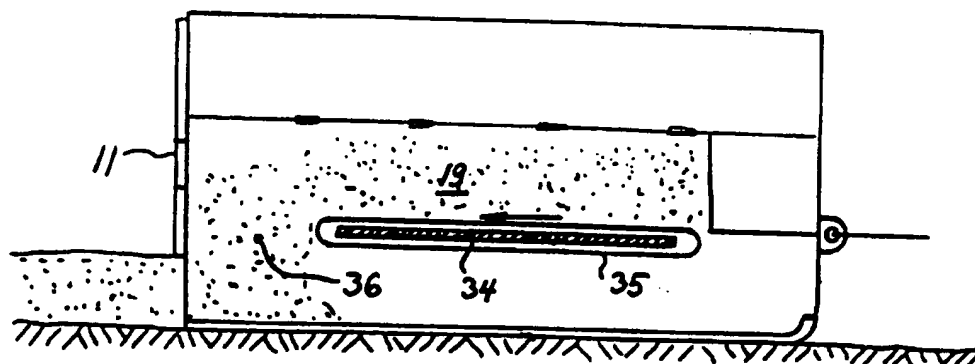
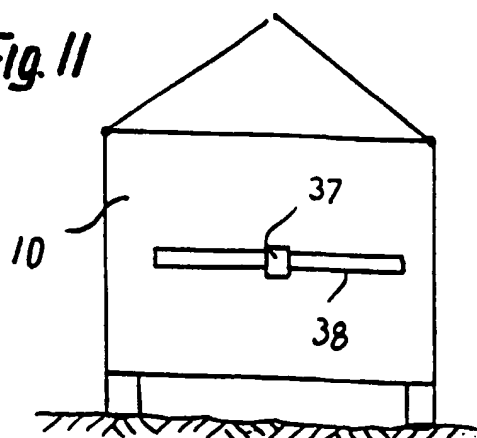
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4/5

*Fig. 9**Fig. 10**Fig. 11*

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Fig. 12

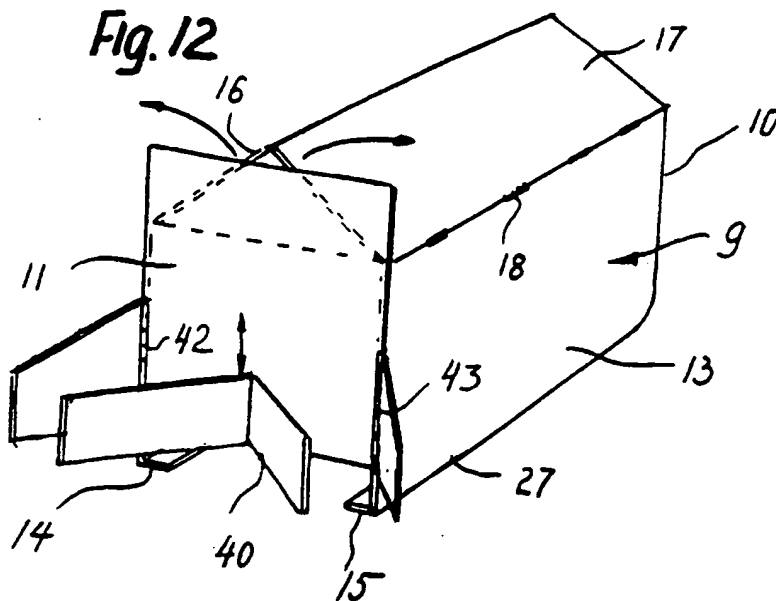


Fig. 13

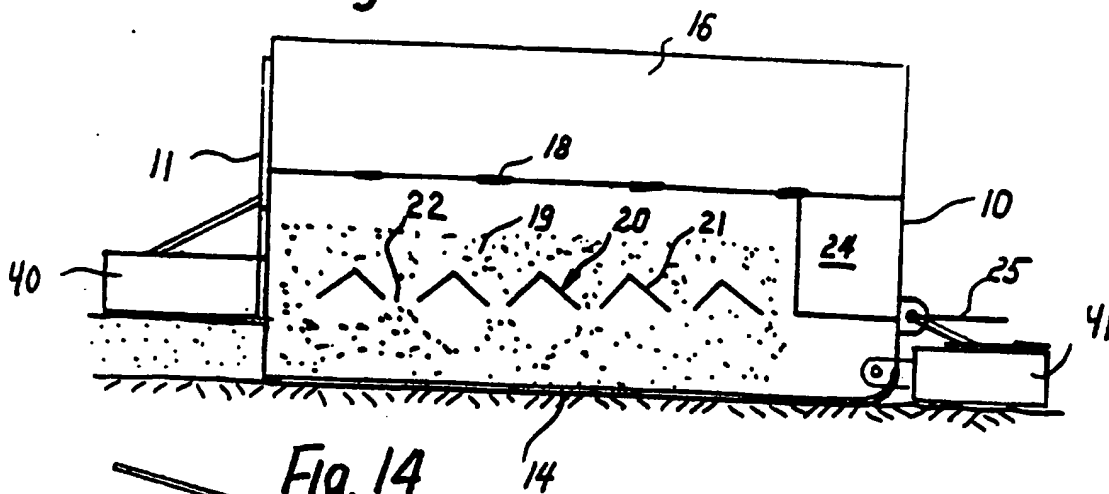
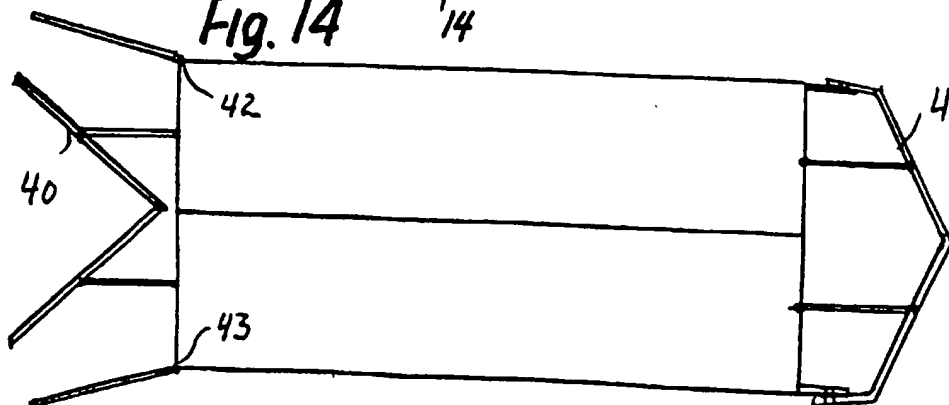


Fig. 14





## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 96/00123

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: E02D 17/12, E02F 5/12

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: E02D, E02F, F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0251876 A1 (ETS. RIVARD S.A.), 7 January 1988 (07.01.88), column 6, line 54 - line 57; column 7, line 2 - line 4; column 7, line 13 - line 18	1-2
A	--	3-9
A	US 3849998 A (M.E. THACKER), 26 November 1974 (26.11.74)	3-9
A	--	
A	NO 158469 B (THE BRITISH PETROLEUM), 6 June 1988 (06.06.88)	3-9
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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 96/00123

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4289424 A (R.J. SHEFBUCH ET AL), 15 Sept 1981 (15.09.81)  -----  -----	3-9

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

28/10/96

International application No.  
PCT/NO 96/00123

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US-A- 3849998	26/11/74	NONE	
NO-B- 158469	06/06/88	NONE	
US-A- 4289424	15/09/81	NONE	